

## WHAT IS CLAIMED IS:

1. An epoxy resin composite formed article composed of an epoxy resin and fibers, **characterized in that:**

the fibers are arranged along a first plane and molecular chains of the epoxy resin are oriented in a direction intersecting with the first plane therein,

and that a degree of orientation  $\alpha$  of the molecular chains of the epoxy resin is in a range of 0.5 or more and less than 1, as determined by the following expression (1) based on X-ray diffraction measurement,

$$\text{Degree of orientation } \alpha = (180 - \Delta\beta / 180) \quad (1)$$

wherein  $\Delta\beta$  represents a full width at half maximum in an intensity distribution measured in an azimuth angle direction from 0 to 360° at a fixed peak scatter angle in the X-ray diffraction measurement,

and that each of the thermal expansion coefficients of the epoxy resin composite formed article in the direction along the first plane and in the direction intersecting with the first plane is in a range of  $5 \times 10^{-6}$  to  $50 \times 10^{-6}$  (/K) and a difference between the thermal expansion coefficients in the direction along the first plane and in the direction intersecting with the first plane is  $30 \times 10^{-6}$  (/K) or less.

2. The epoxy resin composite formed article according to claim 1, **characterized in that:**

the epoxy resin is a liquid crystalline epoxy resin having a mesogenic group in its molecular.

3. The epoxy resin composite formed article according to claims 1 or 2, **characterized in that:**

the fibers comprise at least one of a fiber cloth and single fibers.

4. The epoxy resin composite formed article according to any one of claims 1 to 3, **characterized in that:**

the fibers consist of at least one selected from glass fibers, ceramic fibers, carbon fibers, metal fibers, and organic fibers.

5. A printed wiring board formed of the epoxy resin composite formed article according to any one of claims 1 to 4, **characterized in that:**

an electrically conductive layer is provided on at least one of a surface and inside of the epoxy resin composite formed article.

6. A method for producing the epoxy resin composite formed article according to any one of claims 1 to 4, **characterized by** the steps of:

disposing the fibers within a cavity of a mold in such a manner that the fibers are arranged along the first plane, impregnating the fibers with an epoxy resin composition by filling the cavity of the mold with the epoxy resin composition,

orienting molecular chains of the epoxy resin in a direction intersecting with the first plane, and

curing the epoxy resin composition while the orientation of the molecular chains of the epoxy resin is maintained.

7. The method according to claim 6, **characterized in that:**

in the step of orienting the molecular chains of the epoxy resin, the orientation of the molecular chains of the epoxy resin is accomplished by application of a magnetic field thereto.

8. A method for producing the printed wiring board according to claim 5, **characterized by** the steps of:

disposing the fibers within a cavity of a mold in such

a manner that the fibers are arranged along the first plane,  
 impregnating the fibers with an epoxy resin composition  
 by filling the cavity of the mold with the epoxy resin  
 composition,

orienting molecular chains of the epoxy resin in a  
 direction intersecting with the first plane,

curing the epoxy resin composition while the orientation  
 of the molecular chains of the epoxy resin is maintained, and

providing an electrically conductive layer on at least  
 one of a surface and inside of the printed wiring board at least  
 either prior to the step of disposing, or after the steps of  
 impregnating, or curing.

9. The method according to claim 8, **characterized in that:**

in the step of orienting, the orientation of the molecular  
 chains of the epoxy resin is accomplished by application of  
 a magnetic field thereto.

10. A method for producing the epoxy resin composite formed  
 article according to any one of claims 1 to 4, **characterized**  
**by** the steps of:

preparing an epoxy resin composition containing the  
 fibers,

filing a cavity of a mold with the epoxy resin composition  
 in such a manner that a major axis of each of the fibers are  
 arranged along the first plane,

orienting molecular chains of the epoxy resin in a  
 direction intersecting with the first plane, and

curing the epoxy resin composition, while the orientation  
 of the molecular chains of the epoxy resin is maintained.

11. A thermoplastic polymer composite formed article composed  
 of a thermoplastic polymer and fibers, **characterized in that:**

the fibers are arranged along a first plane and molecular  
 chains of the thermoplastic polymer are oriented in a direction

intersecting with the first plane therein,

and that a degree of orientation  $\alpha$  of the molecular chains of the thermoplastic polymer is in a range of 0.5 or more and less than 1, as determined by the following expression (1) based on X-ray diffraction measurement,

$$\text{Degree of orientation } \alpha = (180 - \Delta\beta / 180) \quad (1)$$

wherein  $\Delta\beta$  represents a full width at half maximum in an intensity distribution measured in an azimuth angle direction from 0 to 360° with a fixed peak scatter angle in the X-ray diffraction measurement,

and that each of the thermal expansion coefficients of the thermoplastic polymer composite formed article in the direction along to the first plane and in the direction intersecting with the first plane is in a range of  $5 \times 10^{-6}$  to  $50 \times 10^{-6}$  (/K) and a difference between the thermal expansion coefficients in the direction along the first plane and in the direction intersecting with the first plane is  $30 \times 10^{-6}$  (/K) or less.

12. The thermoplastic polymer composite formed article according to claim 11, **characterized in that:**

the thermoplastic polymer is a liquid crystalline polymer having a mesogenic group in its molecular.

13. The thermoplastic polymer composite formed article according to claims 12, **characterized in that:**

the liquid crystalline polymer is at least one selected from aromatic polyester, aromatic polyamide, and aromatic polyesteramide.

14. The thermoplastic polymer composite formed article according to any one of claims 11 to 13, **characterized in that:**

the fibers comprise at least one of a fiber cloth and single

fibers.

15. The thermoplastic polymer composite formed article according to any one of claims 11 to 15, **characterized in that:**

the fibers consist of at least one selected from glass fibers, ceramic fibers, carbon fibers, metal fibers, and organic fibers.

16. A printed wiring board formed of the thermoplastic polymer composite formed article according to any one of claims 11 to 15, **characterized in that:**

an electrically conductive layer is provided on at least one of a surface and inside of the thermoplastic polymer composite formed article.

17. A method for producing the thermoplastic polymer composite formed article according to any one of claims 11 to 15, **characterized by** the steps of:

disposing the fibers within a cavity of a mold in such a manner that the fibers are arranged along the first plane,

impregnating the fibers with a thermoplastic polymer composition by filling the cavity of the mold with the thermoplastic polymer composition,

orienting molecular chains of the thermoplastic polymer in a direction intersecting with the first plane, and

solidifying the thermoplastic polymer composition while the orientation of the molecular chains of the thermoplastic polymer is maintained.

18. A method for producing the thermoplastic polymer composite formed article according to any one of claims 11 to 15, **characterized by** the steps of:

forming a preform of a thermoplastic polymer composition containing the thermoplastic polymer,

disposing the preform and the fibers within a cavity of

a mold in such a manner the preform and the fibers are arranged along the first plane,

impregnating the fibers with a thermoplastic polymer composition by melting the preform,

orienting molecular chains of the thermoplastic polymer in a direction intersecting with the first plane, and

solidifying the thermoplastic polymer composition while the orientation of the molecular chains of the thermoplastic polymer is maintained.

19. A method for producing the thermoplastic polymer composite formed article according to any one of claims 11 to 15, **characterized by** the steps of:

preparing a thermoplastic polymer composition containing the thermoplastic polymer and the fibers,

filing a cavity of a mold with the thermoplastic polymer composition in such a manner that a major axis of each of the fibers are arranged along the first plane,

orienting molecular chains of the thermoplastic polymer in a direction intersecting with the first plane, and

solidifying the thermoplastic polymer composition, while the orientation of the molecular chains of the thermoplastic polymer is maintained.

20. The method according to any one of claims 17 to 19, **characterized in that:**

in the step of orienting the molecular chains of the thermoplastic polymer in the direction intersecting with the first plane, the orientation of the molecular chains of the thermoplastic polymer is accomplished by application of a magnetic field thereto.

21. A method for producing the printed wiring board according to claim 16, **characterized by** the steps of:

disposing the fibers within a cavity of a mold in such

a manner that the fibers are arranged along the first plane,  
impregnating the fibers with a thermoplastic polymer composition by filling the cavity of the mold with the thermoplastic polymer composition,

orienting molecular chains of the thermoplastic polymer in a direction intersecting with the first plane,

solidifying the thermoplastic polymer composition while the orientation of the molecular chains of the thermoplastic polymer is maintained, and

providing an electrically conductive layer on at least one of a surface and inside of the printed wiring board at least either prior to the step of disposing, or after the steps of impregnating, or solidifying.

22. A method for producing the printed wiring board according to claim 16, **characterized by** the steps of:

forming a preform of a thermoplastic polymer composition containing the thermoplastic polymer,

disposing the preform and the fibers within a cavity of a mold in such a manner the preform and the fibers are arranged along the first plane,

impregnating the fibers with an thermoplastic polymer composition by melting the preform,

orienting molecular chains of the thermoplastic polymer in a direction intersecting with the first plane,

solidifying the thermoplastic polymer composition while the orientation of the molecular chains of the thermoplastic polymer is maintained, and

providing an electrically conductive layer on at least one of a surface and inside of the printed wiring board at least either prior to the step of disposing, or after the steps of impregnating, or solidifying.

23. A method for producing the printed wiring board according to claim 16, **characterized by** the steps of:

preparing a thermoplastic polymer composition containing the thermoplastic polymer and the fibers,

filing a cavity of a mold with the thermoplastic polymer composition in such a manner that a major axis of each of the fibers are arranged along the first plane,

orienting molecular chains of the thermoplastic polymer in a direction intersecting with the first plane, and

solidifying the thermoplastic polymer composition, while the orientation of the molecular chains of the thermoplastic polymer is maintained, and

providing an electrically conductive layer on at least one of a surface and inside of the printed wiring board at least either prior to the step of disposing, or after the steps of impregnating, or solidifying.

24. The method according to any one of claims 21 to 23, **characterized in that:**

in the step of orienting the molecular chains of the thermoplastic polymer in the direction intersecting with the first plane, the orientation of the molecular chains of the thermoplastic polymer is accomplished by application of a magnetic field thereto.

25. A polymer composite formed article composed of a polymer and fibers, **characterized in that:**

the fibers are arranged along a first plane and molecular chains of the polymer are oriented in a direction intersecting with the first plane therein,

and that a degree of orientation  $\alpha$  of the molecular chains of the polymer is in a range of 0.5 or more and less than 1, as determined by the following expression (1) based on X-ray diffraction measurement,

$$\text{Degree of orientation } \alpha = (180 - \Delta\beta / 180) \quad (1)$$



wherein  $\Delta\beta$  represents a full width at half maximum in an intensity distribution measured in an azimuth angle direction from 0 to 360° with a fixed peak scatter angle in the X-ray diffraction measurement,

and that each of the thermal expansion coefficients of the polymer composite formed article in the direction along the first plane and in the direction intersecting with the first plane is in a range of  $5 \times 10^{-6}$  to  $50 \times 10^{-6}$  (/K) and a difference between the thermal expansion coefficients in the direction along the first plane and in the direction intersecting with the first plane is  $30 \times 10^{-6}$  (/K) or less.